



Milk Pasteurization on the Small Farm or in the Home

Milk is a natural liquid food. It is one of our most nutritionally complete foods, adding high-quality protein, fat, milk sugar, essential minerals, and vitamins to the diet. Since prehistoric times, we have used milk in many ways: to drink; to churn into butter; to make into cheeses and cultured products, such as yogurt¹ and buttermilk; and to combine with other ingredients to make frozen desserts, candy, and baked goods.

Guarding Against Disease

Milk contains bacteria and, when improperly handled, provides an excellent medium in which bacteria can multiply. Most of the bacteria in fresh milk from a healthy animal are either harmless or beneficial. However, rapid changes in the health of an animal or of the milk handler, or contaminants from polluted water, dirt, manure, vermin, air, cuts, and wounds can make raw milk potentially dangerous.

Bacteria contaminating raw milk have been linked to numerous outbreaks of typhoid fever, diphtheria, septic sore throat, scarlet fever, dysentery, Q-fever, gastroenteritis, and food poisoning in the United States. Other diseases, including tuberculosis and undulant fever (brucellosis), may be transmitted to human beings in raw milk from diseased animals.

Many farm families regularly drink raw milk without any ill effects and, perhaps over a period of time, they have built up body immunities to many milkborne diseases. However, guests or public customers who consume raw milk could be exposed to unnecessary or extremely costly risks for which a milk producer could be held liable. To reduce these risks, the U.S. Department of Agriculture (USDA) recommends the pasteurization of milk for home and market use. Milk offered for sale may be subject to regulation by local and State authorities, and a permit to sell milk may be required by these authorities.

Pasteurization, named for Louis Pasteur (who first developed the process for other foods), is a moderate but exact heat treatment of milk which will kill bacteria

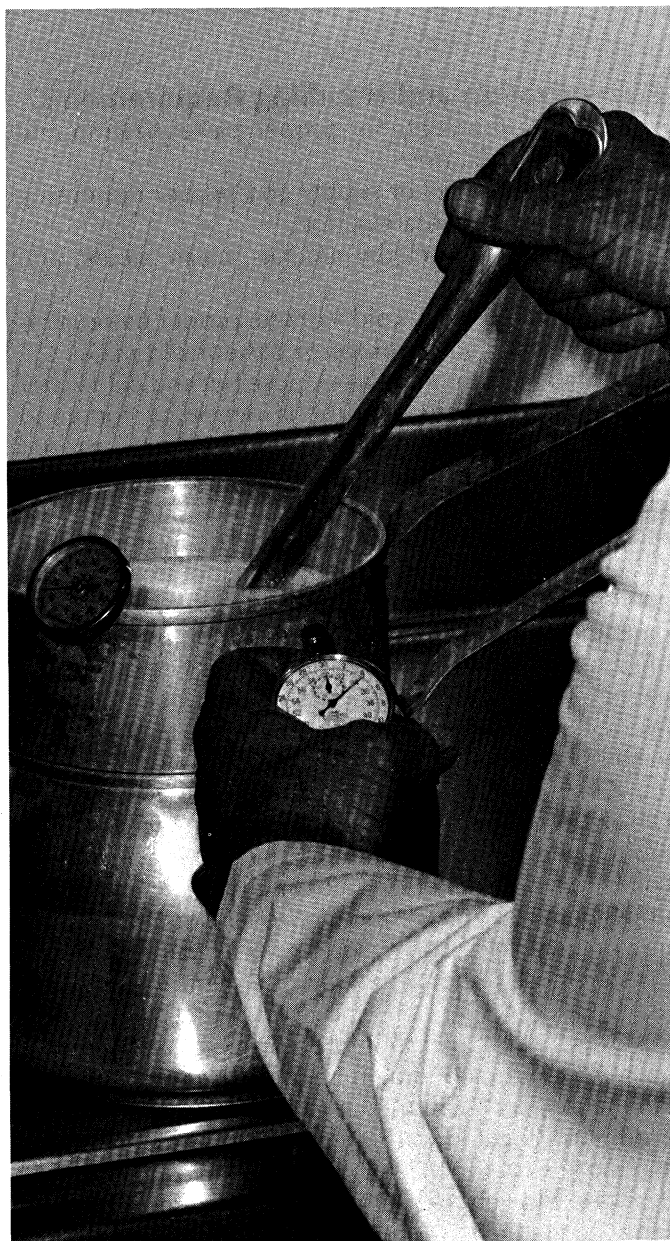


Figure 1—You can make quick and easy work of pasteurizing milk by using a double boiler. (A-1233-113)

¹"How to Make Yogurt," U.S. Department of Agriculture, CA-NE-9, 1975.

that produce disease and will retard spoilage in milk. This process makes milk safe to drink and increases its storage life. Pasteurization does not involve complete sterilization, and milk may become contaminated after pasteurization. Rapid cooling, sanitary handling, and storage in a closed container at 40°F (4°C) or less will minimize contamination and spoilage problems.

Pasteurization and Handling Requirements

The requirements for proper pasteurization and handling of milk are—

- A potable water supply and proper dispensing system to avoid contamination.
- Clean and healthy animals, clean hands, and clean utensils.
- Rapid cooling, cold storage, proper pasteurization, and clean cold storage of pasteurized milk.

Potable Water Supply—A pure hot and cold water supply of adequate amount is necessary for good health and milk production of the animals, proper cleanliness of milk handlers and animals, and proper cleaning and sanitizing of utensils used in milking, pasteurization, and storage of milk. The water supply should be tested by an approved laboratory twice a year or any time after a system is modified or exposed to contaminants. A periodic inspection should be made to ensure that no cross connection or leak in the system exists where contaminated water can siphon back into the system by a pressure drop when a faucet is opened in the system.

Clean and Healthy Animals, Clean Hands, and Clean Utensils—Animals should be clipped regularly around the flanks and udder to keep long hair from collecting dirt. Milkers should wash their hands and the udder with clean water or an approved germicidal solution before they begin milking. Milk from diseased animals or those under antibiotic treatment **must not** be used.

The milking pail should be properly cleaned and have a small top opening to reduce the chance of contamination by manure or airborne contaminants. Prompt rinsing and washing of dirty utensils are easier and more effective than cleaning utensils on which dirt has been allowed to dry. Stainless steel utensils are preferred since they are durable and easy to clean.

Cooling and Storage—Prompt cooling of milk to 40°F (4°C) or less and storage at that temperature in a closed container, before and after pasteurization, is essential to maintain the quality and flavor of the milk. Care should be taken not to transfer barnyard dirt from the bottom or sides of the storage container to the countertop or to utensils in the kitchen or pasteurization area.

Milk from a milking should not be mixed with cooled milk from a previous milking unless you plan to pasteurize the mixture immediately.

How to Pasteurize Milk

Milk must be heated, with agitation, in such a way that every particle of the milk, including the foam, receives a minimum heat treatment of 145° F (63° C) continuously for 30 minutes or 161° F (72° C) for 15 seconds. The temperature is monitored with an accurate metal or protected glass thermometer. It is common practice commercially to use a high-temperature, short-time process in which the milk is heated to 170° F (77° C) for 15 seconds and then cooled immediately to below 40° F (4° C) to increase storage life without any noticeable flavor changes in the milk.

Pasteurization of fluid milk requires very specific amounts of time and temperatures. The procedure is as follows:

Temperature-Time Pasteurization Requirements for Fluid Milk

<i>Temperature</i>	<i>Time</i>
• 145° F (63° C) (vat pasteurization)	30 minutes
• 161° F (72° C) (high temperature, short-time pasteurization)	15 seconds
• 191° F (89° C)	1 second
• 212° F (100° C)	0.01 second

A good compromise for home pasteurization is to heat the milk to 165° F (74° C) in a double boiler and to hold it at this temperature for 15 seconds while stirring constantly. Then cool it immediately, while stirring, to below 145° F (63° C) by setting the top of the double boiler in cold water. Add ice to the cooling water to cool the milk further, stirring occasionally until the temperature of the milk falls below 40° F (4° C). Store the cooled milk in clean, covered containers and keep it at a temperature below 40° F (4° C) until used. This method is preferred over the one in which the milk is held at 145° F (63° C) for 30 minutes because if at any time during the 30-minute period the temperature drops below 145° F (63° C), the milk must be reheated for 30 minutes. Milk may also be pasteurized at 145° F (63° C) for 30 minutes in jars in a waterbath canner, provided care is taken to maintain the temperature and the milk is cooled promptly to 40° F (4° C) or less.

Any thermometer, stirring device, or other object placed in contact with the milk must not be removed at any time during the entire pasteurization process. These objects contain unpasteurized milk and, if they are removed and then replaced in the container, they will contaminate the milk.

Electric batch-type home pasteurizers with a capacity of 2 gallons (7.6 liters) or more can be bought from supply houses. As little as 2 quarts (1.9 liters) may be pasteurized in these units. When they are operated

according to manufacturers' directions, proper pasteurization will require little attention.

Proper pasteurization and handling will greatly increase the storage life of milk and will inactivate certain enzymes responsible for rancidity. However, pasteurized milk has not received sufficient heat treatment to improve baking qualities in recipes calling for scalded milk.

Milk for Cheese and Yogurt Making

Cheese and yogurt are fermented milk products that cannot be made unless the milk is of good quality and fermentation can be controlled. Cleanliness and careful handling of the milk are just as important in making cheese and yogurt as in preparing milk to drink. Pasteurization will kill any harmful bacteria and undesirable bacteria, such as those that produce gas or off-flavors in cheese. At the same time, beneficial

bacteria that are needed to produce lactic acid during the making of cheese or yogurt are also killed, so a starter culture of bacteria that produces lactic acid must be added to the pasteurized milk.

It is essential to use pasteurized milk in preparing proper starter culture in making cheese and yogurt. Complete directions for making cottage cheese, American-type cheese, and yogurt in the home may be obtained from USDA.

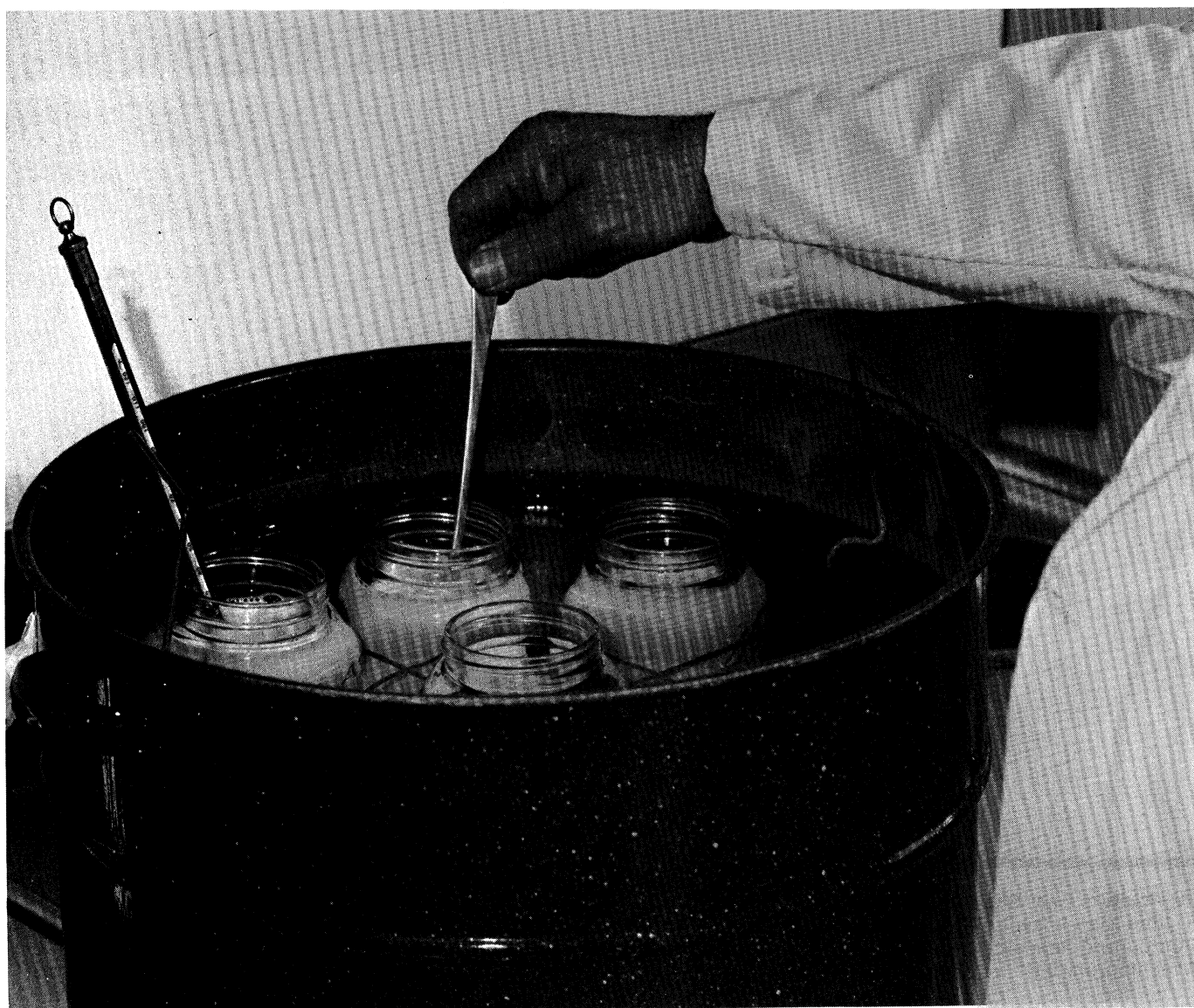


Figure 2—Using canning jars, placed on a rack inside of a large pot, is a handy method of pasteurization. You must make sure that the water level in the pot is above the water level of the milk in the jars. (A-1233-II2)

This Fact Sheet supersedes leaflet 408, "Facts About Pasteurization of Milk," 1974.

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